

Science Olympiad --Cobra Invitational

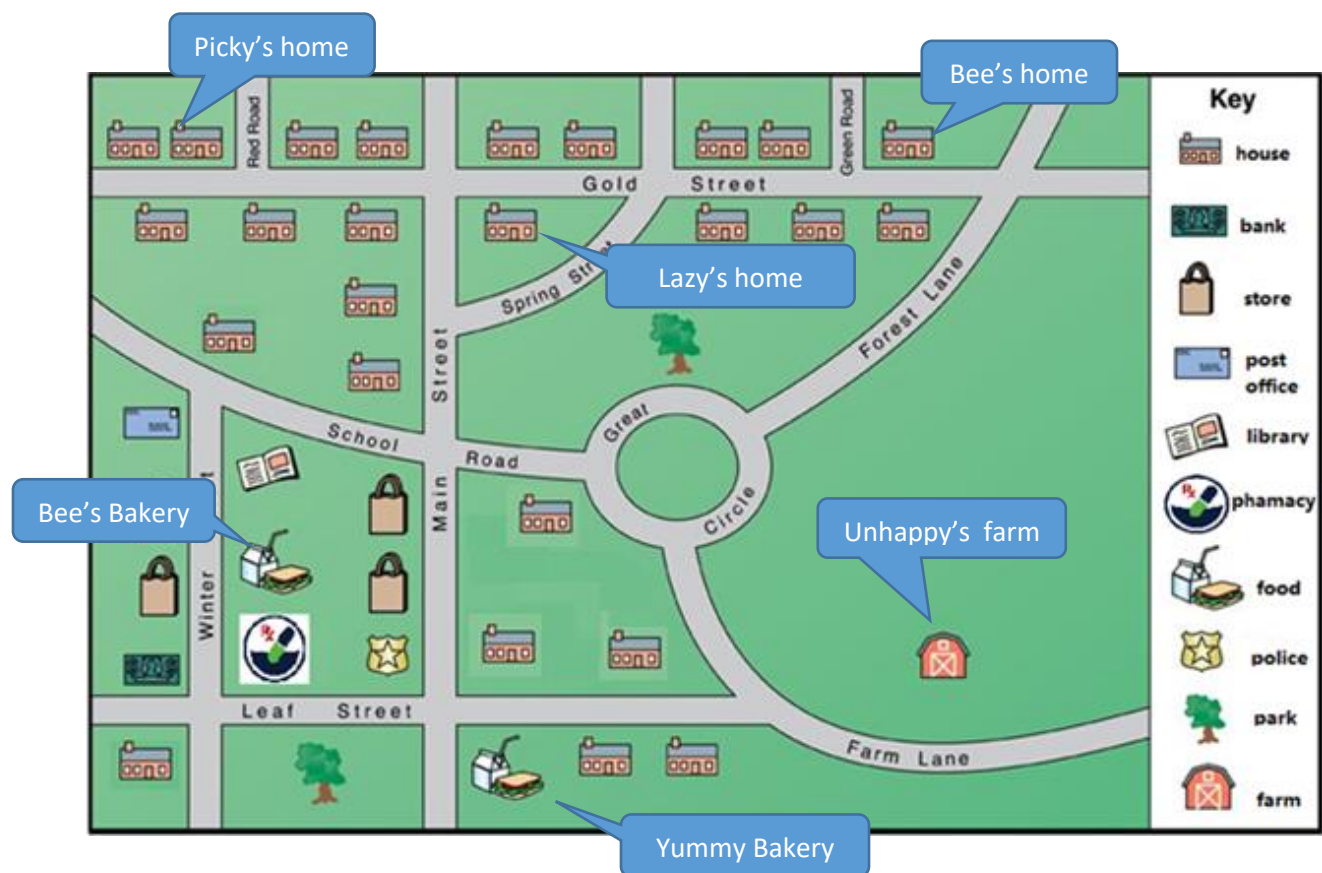
Feb 03, 2018

# Crime Busters

**Please use the provided answer sheet to answer all the questions.**

- The scoring is composed of these elements:
- Unknowns Identification (50% of total score) (Second Tiebreaker)
- Shoe print (2%)
- Paper Chromatography (5%)
- Fiber and plastic (10%)
- DNA (8%)
- Crime Solution Essay (25%) (First Tiebreaker)

## Crime Scene Scenario: Yummy Bakery Break-in



A new bakery, Yummy Bakery, was opened recently and very quickly becomes popular in town. A break-in happened last night and much of the bakery equipment was damaged. A note was left on the kitchen door saying 'You are cursed'.

Police collected some unknown powders at the crime scene, and one shoe print. They also found fiber from the broken door frame which may come from the suspect's cloth. The police did paper chromatography analysis for the ink from the note and the result is shown in picture 1. Table 1 lists all the collected crime scene evidence.

The security camera of nearby police station helped police identify four suspects of the crime. Details about these four suspects are shown in the next few pages.

Table 1 Evidence collected from crime scene

Crime Scene Evidence (CSE)	description	Note
CSE-1	Powder	
CSE-2	powder	
CSE-3	powder	
CSE-4	powder	
CSE-5	mixture	
CSE-6	mixture	
CSE-7	mixture	
CSE-8	fiber	
CSE-9	Ink	Picture 1
CSE-10	Shoe print	Picture 2



Picture 1 Paper chromatography result (CSE-9)



Picture 2 Shoe print (CSE-10)

## Suspect C



Ms. Cookie is the owner of another bakery in town. Her store sales has been falling significantly after Yummy Bakery opened. She mentioned to lots of people that she would love to see Yummy Bakery go out of business.

Ms. Cookie was found on the security camera from police station around 11:05PM wearing a light color pullover. Ms. Cookie claims that she was jogging that time. She stays in her bakery all day attending to business and has time to exercise only after the store closes at 10PM.

Table 2 Evidence collected from Bee

Suspect Evidence: Cookie (C)	description	Collected from	Note
C-1	Powder	Cookie's pullover	
C-2	Mixture	Cookie's pullover	
C-3	Ink	Cookie's pen	
C-4	Fiber	Cookie's pullover	PE
C-5	Shoe print	Cookie's shoe	Shown in picture 3



Picture 3 Cookie's shoe print (C-5)

## Suspect L



Mr. Lazy used to work for Yummy Bakery. Lazy always took a very long break on a bench in the nearby park every day during the bakery's busy hours. Lazy was warned by the bakery owner about his improper behavior a few times. Yesterday, Mr. Lazy was fired after his routine long break, and he said the bakery will be in big trouble soon.

Lazy was seen on the security camera around 1:20AM wearing a light color sweater. Lazy claimed that he was sick last night and went to the Pharmacy to buy medicines.

Table 2 Evidence collected from Lazy

Suspect Evidence : Lazy (L)	description	Collected from	Note
L-1	Powder	Lazy's sweater	
L-2	mixture	Lazy's sweater	
L-3	Ink	Lazy's pen	
L-4	fiber	Lazy's sweater	wool
L-5	Shoe print	Lazy's shoe	Shown in picture 4



Picture 4 Lazy's shoe print (L-5)



## Suspect P



Ms. Picky is a not-welcomed customer of Yummy Bakery. She is very picky about the food and has returned her orders a few times. Yesterday, Picky went to the bakery to return a very expensive (\$150) cake she bought two weeks ago because 'it does not taste fresh'. The store rejected her request which made Ms. Picky very mad.

Picky was recorded on the security camera at 12:45AM wearing a light-colored coat. She claimed that she worked all night on her home improvement project (new drywall and granite tiles for bathroom). After that she realized that a book borrowed from library was due. To avoid paying the fine, she went to the library to drop the book after mid-night.

Table 4 Evidence collected from Picky

Suspect Evidence : Picky (P)	description	Collected from	Note
P-1	Powder	Picky's coat pocket	
P-2	mixture	Picky's' coat pocket	
P-3	Ink	Picky's pen	
P-4	fiber	Picky's coat	cotton
P-5	Shoe print	Picky's's shoe	Shown in picture 5



Picture 5 Picky's shoe print (P-5)

## Suspect U



Mr. Unhappy is the farmer living on the farm near Yummy Bakery. Unhappy claims that the smell from the bakery makes his animals sick, and the milk production from his farm was down by nearly 50% after Yummy opened. He had mentioned to several people that he would use any measure to close down the bakery.

Unhappy was caught on the security camera at 2:25AM wearing a light-colored jacket. When questioned, Unhappy explained that last night he had trouble sleeping as he was worried about his farm, so he went out for a walk.

Table 5 Evidence collected from Unhappy

Suspect Evidence Unhappy (U)	description	Collected from	Note
U-1	Power	Unhappy's jacket	
U-2	Power	Unhappy's jacket	
U-3	Ink	Unhappy's pen	
U-4	fiber	Unhappy's jacket	lien
U-5	shoeprint	Unhappy's shoe	Picture 6



Picture 6 Unhappy's shoe print (U-5)

## Answersheet

**School Name:** \_\_\_\_\_

**Team Number:** \_\_\_\_\_ **Station Number:** \_\_\_\_\_

### 1. Identify unknown powder

Item	Material name	Brief explanation
CSE-1		
CSE-2		
CSE-3		
CSE-4		
CSE-5		
CSE-6		
CSE-7		
B-1		
B-2		
L-1		
L-2		
P-1		
P-2		
U-1		
U-2		



## **2. Shoeprint**

Identify whose shoe print matches the sample collected from the crime scene and give a brief explanation

## **3. Paper chromatography**

Please do paper chromatography for all the sample ink and attach your result paper on this page and label them

## 4. Fiber and plastic

Item	Material name	Brief explanation
CSE-8		

I. Which of the following fiber is man-made material? ( )

A) cotton      B) polyester      C) silk      D) wool

II. Which fiber listed below is unlikely to be used as swimming suite? ( )

A) cotton      B) linen      C) Nylon      D) polyester

III. Which of the following is the suitable material food packaging? ( )

A) PMMA      B) LDPE      C) HDPE      D) PS

IV. Which of the following plastic can be easily identified by putting into water? ( )

A) LDPE      B) HDPE      C) PP      D) PMMA

## 5. DNA

I. In picture 7, whose blood matches the blood stain? ( )

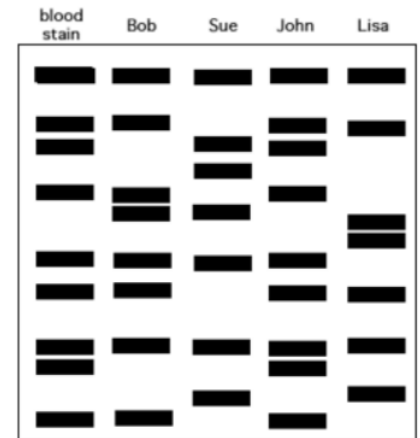
A) Bob      B) Sue      C) John      D) Lisa

II. Which of the following is NOT a nitrogen base? ( )

A) A      B) B      C) C      D) T

III. Which of the following does not have DNA ( )

A) blood      B) hair      C) nail      D) sweat



Picture 7 DNA analysis

IV. A child's DNA comes from ( )

A) father      B) mother      C) both father and mother      D) sibling

V. How do scientists cut DNA into smaller strands? ( )

A) acid      B) base      C) scissors      D) enzymes

## **6. Crime solution essay**